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	[Total Iviai & iv]
1. Sort a random array of n integers (accept the value of n from user) in ascendir	ng order
by using bubble sort algorithm.	[10]
Accept & Display Function	[5]
Bubble Sort Function	[2]
2. Write a C program which uses Binary search tree library and implements follow Functions:	wing
Create Binary search Tree	[10]
Insert a node in a bihary search tree	[10]
Display a binary search tree(In order Traversal)	[5]
o OR	
Q.1) Data Structures Using 'C'  1. A postfix expression of the form ab+cd-*ab/ is to be evaluated after accepting t values of a, b, c and d. The value should be accepted only once and the same valuesed for repeated occurrence of same symbol in the expression. Formulate the province a C program to solve the problem by using appropriate data structures and a contract of the contraction.	ue is to be oblem and
Q 2) Object Oriented Concepts and Programming in C++:	[Total Marks 30]
Q 2) Object official and g	
1. Define a class Message with two data members one character pointer and an instoring length. Implement following functions:	teger
a) Default constructor and Parameterized constructor	[2+3]
b) Overload binary + operator to represent concatenation of messages	[7]
c) Overload [] operator to return a character at a specific position	[8]
d) Overload = operator to copy one Message object to another.	[5]
Write a main function that uses the above class and its member functions.	[5]
OR	
<ul> <li>2. Implement a class 'data' to overload following functions as follows:</li> <li>a) int maximum(int, int) – returns the maximum between the two integer argun</li> <li>b) int maximum(int *a, int arraylength) – returns the maximum integer from an</li> </ul>	n array 'a' [5]
c) void maximum(int *a, int arrarylength, int n) - display all elements from th	e array 'a'
which are greater than given number 'n'.	[5]
d) int minimum (int, int) - returns the minimum between the two integer argur	nents [2]
e) int minimum( int *, int arraylength) – returns the minimum integer from an	array 'a' [5]
f) void minimum(int *a, int arrarylength, int n) –display all elements from the	[5]
which are smaller than given number 'n'.  Write a main function that uses the above class and its member functions.	[6]
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Q.3) Viva	[10]

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by using bubble sort algorithm.	
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Q.3) Viva	[10]

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by using insertion sort algorithm.	
<ul> <li>Accept &amp; Display Function</li> </ul>	[10]
<ul> <li>Insertion Sort Function</li> </ul>	[5]
<ul> <li>There are lists where insertion should ensure the ordering of data elements. Since the elements are in ascending order the search can terminate once equal or greater element is found. Implement a singly linked list of ordered integers (ascending/descending) with insert, search and display operations.</li> <li>Creation of singly linked list in sorted order</li> <li>Search, Display operation carries 4 marks each</li> <li>Insert operation</li> </ul>	[10] [8] [7]
Q.1) Data Structures Using 'C'	
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Q.1) Data Structures Using 'C'		Total Marks 40]
1. Read the data from the file "emplo	oyee.txt" and sort on age using insertion sort.	
<ul> <li>Reading &amp; Display th</li> </ul>		[10]
• Insertion sort Functi		[5]
2. Write a C program that accepts a comparameter to the function) from a	directed graph as an adjacency matrix and converts implement functions to print out degree of any vertex adjacency list	it
<ul> <li>Read a graph as adjace</li> </ul>	ncy Matrix	[5]
<ul> <li>Creation of adjacency :</li> </ul>	List & Display	[7+3]
<ul> <li>Calculate out degree of</li> </ul>	f any vertex i	[10]
•	OR	
Q.1) Data Structures Using 'C'		
using usual precedence of operator	*(b+c)*((d-a)/b) need to be converted to postfix formulate the problem and write a C program to priate data structures and algorithms.	m ,
Q 2) Object Oriented Concepts and F	rogramming in C++:	Fotal Marks 30]
minimum size 8 and having atleast of encrypt a Message using key (use some Accept and Display function for	The restrictions on Key are that the length should one digit and one upper case character in it. Write the encryption algorithm) and decrypt the encrypted or Message & Key class—each carries 5 marks message using encryption algorithm and display	a friend function to text and display it. [10]
	37174	[10]
• Decrypt the encrypted text and		[5]
• Write a main function that uses	the above class and its member functions.	[5]
2 7 1	OR	* - 1
2. Implement a class 'printdata' to over		
eg. print(10) outputs value -<10>	int>, that is, value followed by the value of the integral	
	e – [ <int>, <int>], that is, value followed by the</int></int>	[5]
two integers separated by comma	in square brackets	[5]
eg print(4,6) outputs value-[<4>,<		[2]
	-"char*", that is, value followed by the string in	
double quotes. eg print("hi") outp		[5]
d) void print(int n, char *)- display f	irst n characters from the given string.	
eg print(3,"Object")- outputs value		[5]
	occurrences of a character from the given string.	
eg print('P',''CPP Programming")		[5]
Write a main function that uses the a	bove class and its member functions.	[5]
Q.3) Viva		10

٧٠.	a, Data Structures Using 'C'	[Total Marks 40]
	1. Read the data from the file "employee.txt" and sort on age using Bubble sort.	
	• Reading the contents of File & Display Function	[10]
	Bubble sort Function	[10] [5]
		[5]
-	<ul> <li>2. Write a C program that accepts the graph as an adjacency matrix and converts i to adjacency list representation. Implement functions to print out degree of any vertex i (take i as parameter to the function) from adjacency list</li> <li>Read a graph as adjacency Matrix</li> </ul>	
	Creation of adjacency List	[5]
	Calculate out degree of any vertex i	[10]
Q.		[10]
	OR	
Q.1	) Data Structures Using 'C'	
	1. Suppose that we are selling the services of a machine. Each user uses the machine	
	a fixed amount of time. However the people are ready to pay different amounts service. We wish to maximize the returns from this machine under the assumpt machine is not to be kept idle unless no user is available. Whenever the machine available, the user with the highest paying amount is selected. When a new use the machine, he has to wait if there are pending requests. Formulate the problem a C program to solve the problem by using appropriate data structures and algo-	tion that the ne becomes or requests on and write
Q 2	Object Oriented Concepts and Programming in C++:	[Total Marks 30]
10 10 10 10	Implement the following class hierarchy: Student: id, name, StudentExam (derived from Student): with n subjects (n can be variable) StudentResult (derived from StudentExam): with percentage, grade	
	Define a parameterized constructor for each class and appropriate functions to accept and display details. Create n objects of the StudentResult class and display the mark using suitable manipulators	ot list
	and display details. Create n objects of the StudentResult class and display the mark using suitable manipulators.	list
	and display details. Create n objects of the StudentResult class and display the mark	list s 2 marks
1 1 1	<ul> <li>and display details. Create n objects of the StudentResult class and display the mark using suitable manipulators.</li> <li>Parameterized constructor, accept and display for each class-each function carries</li> </ul>	list s 2 marks [18]
	and display details. Create n objects of the StudentResult class and display the mark using suitable manipulators.	list s 2 marks [18] [7]
	<ul> <li>and display details. Create n objects of the StudentResult class and display the mark using suitable manipulators.</li> <li>Parameterized constructor, accept and display for each class-each function carries</li> <li>Display marklist with Use of manipulators</li> </ul>	list s 2 marks [18]
2	and display details. Create n objects of the StudentResult class and display the mark using suitable manipulators.  • Parameterized constructor, accept and display for each class-each function carries.  • Display marklist with Use of manipulators Write main function that uses the above class and its member functions.  OR  Define a class named Clock with three integer data members for hours, minutes and seconds. Define parameterized and default constructors. Overload increment and decrement operators appropriately. Overload extraction and insertion operators. Wr display function. Consider 24 hr format.  • Default constructor and Parameterized constructor	list  s 2 marks  [18]  [7]  [5]  I  ite appropriate  [2+3]
2	and display details. Create n objects of the StudentResult class and display the mark using suitable manipulators.  • Parameterized constructor, accept and display for each class-each function carries.  • Display marklist with Use of manipulators Write main function that uses the above class and its member functions.  OR  • Define a class named Clock with three integer data members for hours, minutes and seconds. Define parameterized and default constructors. Overload increment and decrement operators appropriately. Overload extraction and insertion operators. Wr display function. Consider 24 hr format.  • Default constructor and Parameterized constructor  • Overloading of each operator carries 5 marks	[18] [7] [5]  I ite appropriate  [2+3] [20]
2	and display details. Create n objects of the StudentResult class and display the mark using suitable manipulators.  • Parameterized constructor, accept and display for each class-each function carries.  • Display marklist with Use of manipulators  Write main function that uses the above class and its member functions.  OR  Define a class named Clock with three integer data members for hours, minutes and seconds. Define parameterized and default constructors. Overload increment and decrement operators appropriately. Overload extraction and insertion operators. Wr display function. Consider 24 hr format.  • Default constructor and Parameterized constructor  • Overloading of each operator carries 5 marks  • Display Function	[18] [7] [5]  Interpretation of the content of the
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### Q.1) Data Structures Using 'C'

[Total Marks 40]

- 1. Read the data from the file "employee.txt" and sort on names in alphabetical order (use strcmp) using bubble sort
  - Reading the contents of File & Display Function

[10]

Bubble sort Function

[5]

- 2. Write a C program that accepts a directed graph as an adjacency matrix and converts it to adjacency list representation. Write a function to display the graph in adjacency list form.
  - Read a graph as adjacency Matrix

[5]

Creation of adjacency List

[10]

• Display adjacency List & out degree of any vertex i (take i as parameter to the function) each carries 5 marks

#### OR

# Q.1) Data Structures Using 'C'

1. A factory has many machines and many jobs that require processing on some of the machines. Each job has a job card which contains all the attributes of a job including the machines on which it need to be processed and the processing time. For simplicity let us assume that there are ten machines numbered 0,1, 2...9, each job is processed for fixed amount of time and the job card number is coded in such a way that the machine requirements can be accessed. For example if job card number is 5438, it means job requires processing on machines 5, 4, 3 and 8. The job can be processed simultaneously on these machines. However each machine can process jobs one at a time and takes up the new job when it becomes idle. Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms

## Q 2) Object Oriented Concepts and Programming in C++:

[Total Marks 30]

- 1. Define a class named Complex for representing complex numbers. A complex number has the general form a + ib, where a- the real part, b the imaginary part are both real numbers and i<sup>2</sup>=-1. Define parameterized and default constructor. Overload +, and \* operators with usual meaning.
  - Default constructor & Parameterized constructor-each carries 3 marks

[6]

• Overloading of + operator & - operator- each carries 5 marks

[10]

Overloading of \* operator

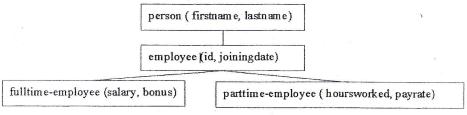
[9]

Write a main function that uses the above class and its member functions.

[5]

#### OR

2. Given the following inheritance hierarchy, implement each of the classes.



The person class has parameterized constructor, accept and display functions. The employee id is auto generated from the last allotted value stored in employee class. Write constructors, accept and display functions for derived classes. Define member function computepay for employee and override appropriately in derived class. Write main program to illustrate use of the classes

- Parameterized constructor, accept and display for each class carries -(2+1+1) marks [16]
- Computepay() for employee [1]
- Overriding of computepay() in derived classes-function in each class carries 4marks [8] Write a main function that uses the above class and its member functions. [5]
- Write a main function that uses the above class and its member functions.

  O.3) Viva

[10]

[10]

[Total Marks 40] Q.1) Data Structures Using 'C' 1. Read the data from the file "employee.txt" and sort on names in alphabetical order (use stremp) using Insertion sort [10] Reading the contents of File & Display Function [5] Insertion sort Function 2. Write a C program that accepts the graph as an adjacency matrix and checks if the graph is undirected. The matrix for undirected graph is symmetric. Also calculate in degree of all vertices [5] Read a graph as adjacency Matrix [10] Check the matrix is symmetric or not [10] Calculate in degree of all vertices OR Data Structures Using 'C' Q.1)1. A file manager identifies each file using an inode-no. A directory is also a file identified by an inode-no. Directory is a list of files each represented by an inode-no. The list has the header containing the inode-no of the parent that is the directory itself. A separate table indexed by inode-no maintains attributes of files including the name of the file. Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms. [Total Marks 30] Q 2) Object Oriented Concepts and Programming in C++: 1. Implement the following class hierarchy person (firstname, lastname) Teacher (department) student (course) Teaching-Assistant() Define constructors and appropriate functions to accept and display details. Parameterized constructor, accept and display for each class carries-(2+2+2) marks [24] Write main function to accept details of 'n' Teaching-Assistants and display the details. [6] 2. Implement a class "file" with four data members, a string storing the name of the file and integers storing the number of characters, words and lines in the file. Write the following member functions: a) The constructor takes only the file name as the argument and opens the file, counts the characters, words and lines and initializes the other data members. If the file does not exist creates a blank file with the name and other data members are initialized to zero. [6] b) member functions that count number of blank lines [6] c) searches for occurrence of word in the file [5] Write main function that uses the above class and its member functions.

Q.3) Viva

	Maximum Marks: 80
Q.1) Data Structures Using 'C'	[Total 40 Marks]
<ul> <li>1. Sort a random array of n integers (accept the value of n from user) in aso by using a recursive Merge sort algorithm.</li> <li>Accept &amp; Display Function</li> <li>Merge Sort Function</li> </ul>	cending order [8] [7]
2. Write a C program which uses Binary search tree library and implements	[/]
<ul> <li>Search a node in binary search tree</li> <li>Display a binary search tree(Pre- Order Traversal)</li> </ul>	s following Functions [10] [10] [5]
Q.1) Data Structures Using 'C'  1. Polynomials with varying degree can be represented using linked list. A polynomial is represented by a node with structure.  Coefficient exponent Link  For example a polynomial x1000 + 3 x50 + 5 x4 can be represented as	term in a
The number of nodes required to represent the polynomial is same as the in the polynomial with an additional node for the header. The nodes are descending order of exponents. One need to accept, display polynomial other operation on polynomials such as addition. Formulate the problem program to solve the problem by using appropriate data structures and a	maintained in the and also perform
<ul> <li>Q 2) Object Oriented Concepts and Programming in C++:</li> <li>1. Write the definition for a class called 'time' that has hours, minutes &amp; second integer data members. Consider 24 hr format. The class has the following members:</li> </ul>	[Total Marks 30]
a) void settime(int, int, int) to set the specified values of hours minutes and	
seconds in object.	[5]
b) void showtime() to display contents of time object.	[6]
c) time add(time) add the corresponding values of hours, minutes and second (<60) in time object argument to current time object and make appropriate conversions and return time.	ls
d) time diff(time) subtract values of hours, minutes and seconds in time object	[8]
argument from current time object after making appropriate conversions ar return time difference.	nd
Write a main program to illustrate the use of above class and member function	[8]
$\mathbf{OR}$	1. [4]
2. Write the definition for a class called Rectangle that has floating point data Members length and width. The class has the following member functions:  a) your settlemeth float to set the length of the settlement.	
<ul><li>a) void setlength(float) to set the length of data member</li><li>b) void setwidth(float) to set the width of data member</li></ul>	[2]
c) float perimeter() to calculate and return the perimeter of the rectangle	[2]
d) float area() to calculate and return the area of the rectangle	[2]
e) void show() to display the length and width of the rectangle f) Overload compare() to	[2] [2]
<ul> <li>compare two rectangles by length and width</li> </ul>	[7]
<ul> <li>compare two rectangles by area</li> </ul>	101
Write main function to create two rectangle objects and display each rectangle and Vive	and its area and perimeter [5]
Q.3) Viva	[10]

1. Define a class named Clock with three integer data members for hours, minutes and seconds. Define parameterized and default constructors. Overload increment and decrement operators appropriately. Overload extraction and insertion operators. Consider 24 hr format.  • Default constructor and Parameterized constructor  • Overloading of each operator carries 5 marks  • Disply Function  Write a main function that uses the above class and its member functions.  OR  2. Write the definition for a class called Rectangle that has floating point data Members length and width. The class has the following member functions:  a) void setlength(float) to set the length of data member  b) void setwidth(float) to set the width of data member  c) float perimeter() to calculate and return the perimeter of the rectangle  d) float area() to calculate and return the area of the rectangle  e) void show() to display the length and width of the rectangle  f) Overload compare() to  • compare two rectangles by length and width  • compare two rectangles by area  Write main function to create two rectangle objects and display each rectangle  and its area and perimeter.  [5]	Q.1) Data Structures Using 'C'	[Total Marks 40]
Functions (use Recursion).  Create Binary search Tree Count all leaf nodes in Binary search tree Post order Traversal  OR  Cons Structures Using 'C'  The Josephus problem is the following game. N people, numbered 1 to N are sitting in a circle. Starting at person 1, a hot potato is passed, After M passes, the person holding the hot potato is eliminated, the circle closes ranks, and the game continues with the person who was sitting after the eliminated person picking up the hot potato. The last remaining person wins. Thus, If M=0 and N=5, players are eliminated in order, and player 5 wins. If M=1 and N=5, the order of elimination is 2, 4, 1, 5 and the player 3 wins. The Josephus problem needs to be solved for general values of M and N (N > 10000).  Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms.  2) Object Oriented Concepts and Programming in C++: [Total Marks 30]  1. Define a class named Clock with three integer data members for hours, minutes and seconds. Define parameterized and default constructors. Overload increment and decrement operators appropriately. Overload extraction and insertion operators. Consider 24 hr format.  Default constructor and Parameterized constructor Define a class named Clock with three integer data members for hours, minutes and seconds. Define parameterized and default constructors. Overload increment and decrement operators appropriately. Overload extraction and insertion operators. Consider 24 hr format.  Default constructor and Parameterized constructor Define a class called Agraemeterized constructor Define a class called Noverloading of each operator carries 5 marks Default constructor and Parameterized constructor Defined a main function that uses the above class and its member functions.  OR  2. Write the definition for a class called Rectangle that has floating point data Members length and width. The class has the following member functions:  Define a main function for a class called Rectangle that has f	by using recursive Quick sort algorithm.  • Accept & Display Function	[8]
2.1) Data Structures Using 'C'  1. The Josephus problem is the following game. N people, numbered 1 to N are sitting in a circle. Starting at person 1, a hot potato is passed, After M passes, the person holding the hot potato is eliminated, the circle closes ranks, and the game continues with the person who was sitting after the eliminated person picking up the hot potato. The last remaining person wins. Thus, If M=0 and N=5, players are eliminated in order, and player 5 wins. If M=1 and N=5, the order of elimination is 2, 4, 1, 5 and the player 3 wins. The Josephus problem needs to be solved for general values of M and N (N ≥ 10000). Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms.  2 2) Object Oriented Concepts and Programming in C++: [Total Marks 30]  1. Define a class named Clock with three integer data members for hours, minutes and seconds. Define parameterized and default constructors. Overload increment and decrement operators appropriately. Overload extraction and insertion operators. Consider 24 hr format.  2 Default constructor and Parameterized constructor  3 Default constructor and Parameterized constructor  4 Overloading of each operator carries 5 marks  5 Disply Function  6 Overloading of each operator carries 5 marks  6 Disply Function  7 OR  2. Write the definition for a class called Rectangle that has floating point data Members length and width. The class has the following member functions:  a) void setlength(float) to set the width of data member  6 Disply remeter() to calculate and return the perimeter of the rectangle  9 Disply function to calculate and return the perimeter of the rectangle  10 Disply and parameter() to calculate and return the perimeter of the rectangle  11 Define a compare two rectangles by length and width  12 Compare two rectangles by length and width  13 Compare two rectangles by area  24 Write main function to create two rectangle objects and display each rectangle and its area and perimeter.	Functions (use Recursion).  Create Binary search Tree  Count all leaf nodes in Binary search tree  Post order Traversal	[10] [10]
1. The Josephus problem is the following game. N people, numbered 1 to N are sitting in a circle. Starting at person 1, a hot potato is passed, After M passes, the person holding the hot potato is eliminated, the circle closes ranks, and the game continues with the person who was sitting after the eliminated person picking up the hot potato. The last remaining person wins. Thus, If M=0 and N=5, players are eliminated in order, and player 5 wins. If M=1 and N=5, the order of elimination is 2, 4, 1, 5 and the player 3 wins. The Josephus problem needs to be solved for general values of M and N (N > 10000). Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms.  2 2) Object Oriented Concepts and Programming in C++: [Total Marks 30]  1. Define a class named Clock with three integer data members for hours, minutes and seconds. Define parameterized and default constructors. Overload increment and decrement operators appropriately. Overload extraction and insertion operators. Consider 24 hr format.  • Default constructor and Parameterized constructor  • Default constructor and Parameterized constructor  • Overloading of each operator carries 5 marks  • Disply Function  Write a main function that uses the above class and its member functions.  OR  2. Write the definition for a class called Rectangle that has floating point data Members length and width. The class has the following member functions:  a) void setlength(float) to set the length of data member  c) float perimeter() to calculate and return the perimeter of the rectangle  d) float area() to calculate and return the area of the rectangle  e) void show() to display the length and width of the rectangle  f) Overload compare() to  • compare two rectangles by length and width  • compare two rectangles by length and width  • compare two rectangles by length and width  • compare two rectangles by area  Write main function to create two rectangle objects and display each rectangle and its area and perimet		
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parameterized and default constructors. Overload increment and decrement operators appropriately.  Overload extraction and insertion operators. Consider 24 hr format.  • Default constructor and Parameterized constructor  • Overloading of each operator carries 5 marks  • Disply Function  Write a main function that uses the above class and its member functions.  OR  2. Write the definition for a class called Rectangle that has floating point data  Members length and width. The class has the following member functions:  a) void setlength(float) to set the length of data member  b) void setwidth(float) to set the width of data member  c) float perimeter() to calculate and return the perimeter of the rectangle  d) float area() to calculate and return the area of the rectangle  e) void show() to display the length and width of the rectangle  f) Overload compare() to  • compare two rectangles by length and width  • compare two rectangles by area  Write main function to create two rectangle objects and display each rectangle  and its area and perimeter.  [5]	Q 2) Object Oriented Concepts and Programming in C++:	[Total Marks 30]
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Members length and width. The class has the following member functions:  a) void setlength(float) to set the length of data member  b) void setwidth(float) to set the width of data member  c) float perimeter() to calculate and return the perimeter of the rectangle  d) float area() to calculate and return the area of the rectangle  e) void show() to display the length and width of the rectangle  f) Overload compare() to  compare two rectangles by length and width  compare two rectangles by area  Write main function to create two rectangle objects and display each rectangle  and its area and perimeter.  [5]	OR	* * *
• compare two rectangles by length and width • compare two rectangles by area  Write main function to create two rectangle objects and display each rectangle and its area and perimeter.  [5]	Members length and width. The class has the following member function a) void setlength(float) to set the length of data member b) void setwidth(float) to set the width of data member c) float perimeter() to calculate and return the perimeter of the rectange d) float area() to calculate and return the area of the rectangle e) void show() to display the length and width of the rectangle	[2] [2] [2] [2]
Write main function to create two rectangle objects and display each rectangle and its area and perimeter. [5]		
and its area and perimeter. [5]	• compare two rectangles by area  Write main function to greate two rectangle objects and display each rect	
Q.3) Viva		[5]
	Q.3) Viva	[10]

[Total Mar.	ks 40
<ul> <li>1. Read the data from the 'employee.txt' file and sort on age using Merge sort and write the sorted data to another file 'sortedemponage.txt'.</li> <li>Reading &amp; Display the file</li> <li>Merge sort Function</li> </ul>	[10] [5]
2. Write a C program which uses Binary search tree library and implements following Functions	£2 J
<ul> <li>Create Binary search Tree</li> <li>In order Traversal</li> <li>Search a node in binary search tree</li> <li>Count all nodes in binary search tree</li> </ul>	[10] [5] [5]
OR	
1. Consider the database of books maintained in a library system When a user wants to check whether a particular book is available, a search operations is called for. If the book is available and is issued to the user, a delete operation can be performed to remove this book from the set of available books. When the user returns the book, it can be inserted back into the set of available books. It is essential that we are able to support the above mentioned operations as efficiently as possible as since these operations are performed quite frequently. Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms.  [Total Mar.]	rks 30]
<ol> <li>Implement a class 'data' to overload following functions as follows:         <ul> <li>int maximum(int, int) – returns the maximum between the two integer arguments</li> <li>int maximum(int *a, int arraylength) – returns the maximum integer from an array 'a'</li> <li>void maximum(int *a, int arraylength, int n) – display all elements from the array 'a' which are greater than given number 'n'.</li> <li>int minimum(int, int) – returns the minimum between the two integer arguments</li> <li>int minimum(int *, int arraylength) – returns the minimum integer from an array 'a'</li> <li>void minimum(int *a, int arraylength, int n) –display all elements from the array 'a' which are smaller than given number 'n'.</li> </ul> </li> <li>Write a main function that uses the above class and its member functions.</li> </ol>	[2] [5] [5] [2] [5] [5]
OR	[0]
<ul> <li>2. A book(ISBN) and CD(data capacity) are both types of media(id, title) objects. A person buys 10 media items, each of which can be either book or CD. Display the list of all books and CD's bought. Define the classes and appropriate member functions to accept and display data. Use pointers and concepts of polymorphism (virtual functions).</li> <li>Accept and display for class media, book and CD - each function carries 2 marks</li> <li>Use of polymorphism(virtual function)</li> <li>main function with use of pointers and display list of all books and CD's.</li> </ul>	[12] [8] [10]
Q.3) Viva	

		[ I otal Marks 40]
1	l.Read the data from the 'employee.txt' file and sort on age using Quick sort	
	and write the sorted data to another file 'sortedemponage.txt'.	
	Reading & Display the file	[10]
	Quick sort Function	[5]
2	2. Write a C program which uses Binary search tree library and implements follow	
	Functions	
	• Create Binary search Tree	[10]
	<ul> <li>Search a node in binary search tree</li> </ul>	[10]
	<ul> <li>Display a binary search tree (In order Traversal)</li> </ul>	[5]
	OR	
Q.1)	Data Structures Using 'C'	
0.		
ì	1. An Address book contains the name and other details of friends. User wants to o	
	for a particular name and get the details such as phone number or email address	
	friend. New Addresses are added to the address book. The contact information in require frequent updation. Certain important contact numbers (a small number) via	(*)
	frequently required should be accessible very fast. These contacts may be important	
	(favourites) at some point in time but may not continue to remain so and have to	
	removed. Formulate the problem and write a C program to solve the problem by	
	appropriate data structures and algorithms.	6
Q 2)	Object Oriented Concepts and Programming in C++:	[Total Marks 30]
1.	Implement a class 'invertdata' to overload 'invert' function as follows:	
	a)int invert (int) - returns the inverted integer. Eg. invert(5438) will return 8345	[10]
	b) char * invert ( char *) - returns the reversed string - reverse("comp") will	. ,
	return "pmoc"	[8]
	c)void invert( int * ) – will reverse the array order – An array [5, 7, 12, 4] will be	3
	inverted to [4, 12, 7, 5].	[7]
	Write a main function that uses the above class and its member functions.	[5]
	OR	The Control of the Co
2	Implement the following along hierarchy:	
۷.	Implement the following class hierarchy: Student: id, name,	
	Student Exam (derived from Student): with n subjects (n can be variable)	
	StudentResult (derived from StudentExam): with percentage, grade	
	Define a parameterized constructor for each class and appropriate functions to ac	cent
	and display details. Create n objects of the StudentResult class and display the m	
	using suitable manipulators.	
	• Parameterized constructor, accept and display for each class-each function car	ries 2 marks
		[18]
	<ul> <li>Display marklist with Use of manipulators</li> </ul>	[7]
	Write main function that uses the above class and its member functions.	[5]
	•	
0.37	X72	[40]
Q.3)	Viva	[10]

[Total Marks 40]

	[Total Marks 40]
<ol> <li>Create a random array of n integers. Accept a value x from user and use linear search algorithm to check whether the number is present in the array or not and output the position if the number is present.</li> <li>Accept &amp; Display Function</li> <li>Linear Search Function</li> </ol>	
<ol> <li>Implement a stack library (dystack.h) of integers using a dynamic (linked list) implementation of the stack and implementing the Push, Pop, Is Empty, Init, Peek op Write a menu driven program that includes stack library and calls different stack of Push &amp; Pop operation carries 8 mark each</li> </ol>	
<ul><li>Isempty &amp; Peek carries 4 mark each</li><li>Init</li></ul>	[8] [1]
OR	2 3
<ol> <li>Q.1) Data Structures Using 'C'</li> <li>In breadth first search (BFS) of a Graph we start at vertex v and mark it as having been visited. All unvisited vertices adjacent from v are visited next. The v is thus completely explored. The visited but at unexplored vertices are taken up next for exploration. Exploration continues until no unexplored vertex is left. If BFS is used connected undirected graph G, then all vertices in G get visited and the graph is completely traversed. Thus BFS can be used to check whether graph is connected. Formulate the problem and write a C program to solve the problem by using approphilate structures and algorithms.</li> </ol>	
Q 2) Object Oriented Concepts and Programming in C++:	[Total Marks 30]
<ol> <li>Implement the following class hierarchy:         Student: id, name,         StudentExam (derived from Student): with n subjects (n can be variable)         StudentResult (derived from StudentExam): with percentage, grade         Define a parameterized constructor for each class and appropriate functions to acceand display details. Create n objects of the StudentResult class and display the markusing suitable manipulators.         • Parameterized constructor, accept and display for each class-each function carried     </li> </ol>	klist es 2 marks [18]
Display marklist with Use of manipulators	[7]
Write main function that uses the above class and its member functions.	[5]
OR	
2. Write a C++ program to implement the following:  Define a class 'city' with data members name and STD code. Accept 'n' cities with codes from user. Store this data in the file 'cities.txt'. Write a program that reads the from file cities.txt into the array. Output the list of city with STD codes. Write a sea function to search a city by name and display its STD code.	e data arch
<ul> <li>accept and display function definition-each carries 2 marks</li> <li>writing data to a file and reading data from a file-each carries 5 marks</li> <li>Display list of cities with STD codes from file</li> <li>Search function</li> <li>Write main function that uses the above class and its member functions.</li> <li>Q.3) Viva</li> </ul>	[4] [10] [5] [6] [5] [10]

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Q.1) Data Structures Using 'C'	Total Marks 40
1. Read the data from file 'cities.txt' containing names of 10 cities and their STD co	des.
Accept a name of the city from user and use linear search algorithm to check who	ether
the name is present in the file and output the STD code, otherwise output "city n	ot in
the list".	
<ul> <li>Accept &amp; Display Function</li> </ul>	[8]
• Linear Search Function	[7]
2. There are lists where new elements are always appended at the end of the list. The	e list
can be implemented as a circular list with the external pointer pointing to the last	
element of the list. Implement singly linked circular list of integers with append ar	ıd
display operations. The operation append(L, n), appends to the end of the list, n	
integers either accepted from user or randomly generated	
<ul> <li>Creation of circular Link List &amp; Append Function each carrires 10 mar</li> </ul>	ks [20]
Display Function	[5]
OR	
Q.1) Data Structures Using 'C'	
1. In depth first search of a Graph we start at vertex v and mark it as having been vis	sited. The exploration of
the vertex involves visiting all the adjacent vertices however the exploration of a	vertex is suspended as
soon as a new vertex is reached and the exploration of a new vertex begins. When	the exploration of new
vertex is over, the exploration v is resumed. DFS can be best implemented as	a recursive function. A
topological sort of a directed acyclic graph is a linear ordering of all its vertices su	ch that if G contains ar
edge (u, v), then u appears before v in the ordering. For topological ordering DF	S is called on the graph
and every vertex explored is added onto the front of a linked list that forms	s the topological order.
Formulate the problem and write a C program to solve the problem by using ap	propriate data structures
and algorithms	
Q 2) Object Oriented Concepts and Programming in C++:	[Total Marks 30]
1. Write the definition for a class called "cuboidSolid" that has length, breadth, heigh	nt and mass
has float data members. The class has the following member functions.	
* a) Accept() and Display() functions – each carries 5marks	[10]
b) float getVolume() that returns the volume of the metal	[5]
c) float getSurfaceArea() that returns the surface area	[5]
d) float getDensity() that returns the density	[5]
Write a main program to illustrate the use of above class and member function.	[5]
OR	
2. Define a class account with following specifications:	
private data members: account number - automatically generated six digit accou	nt number, first two
digit are used for bank code (assume the value 82) and next four digits for	
{account number(use static keyword), account type – it can be one of the following	ig type {
saving, current, fixed, recurring}, amount - long integer for the balance amount, O	wner
Name – name of the owner	
Public data members:	ren.
a) Accept () with valid account number and Use of static keyword	[7]
Accept() with validation for account type	[3]
Other data members	[2]
b) Display account information	[5]
c) Deposit an amount in an account	[2]
d) Withdraw an amount after checking the minimum balance condition	[3]
Write a main program to accept information from user and open 'n' accounts	FO3
(Use dynamical memory allocation) and display their information.	[8]
Q.3) Viva	[10]

[Total Marks 40]

1. Read the data from file 'sortedcities.txt' containing names of 10 cities and their STD codes. Accept a name of the city from user and use binary search algorithm to check whether the name is present in the file and output the STD code, otherwise output "city not in the list".	
<ul> <li>Accept &amp; Display Function</li> </ul>	[0]
Binary Search Function	[8]
	[7]
<ul> <li>2. Implement a list library (singlylist.h) for a singly linked list of characters with the institution of singly link list</li> <li>Creation of Singly link list</li> <li>Insert, Delete carries 6 marks each</li> <li>Display Function</li> <li>Search Function</li> </ul> On the Structures Heirer (C)	[4] [12] [4] [5]
Q.1) Data Structures Using 'C'	
1. A postfix expression of the form ab+cd-*ab/ is to be evaluated after accepting the values of a, b, c and d. The value should be accepted only once and the same value is be used for repeated occurrence of same symbol in the expression. Formulate the problem and write a C program to solve the problem by using appropriate data struct and algorithms.	
Q 2) Object Oriented Concepts and Programming in C++:	otal Marks 301
1. Implement a class 'invertdata' to overload 'invert' function as follows:	otal Marks 30]
<ul> <li>l. Implement a class 'invertdata' to overload 'invert' function as follows:</li> <li>a) int invert ( int) - returns the inverted integer. eg. invert(5438) will return 8345</li> <li>b) char * invert ( char *) - returns the reversed string - eg. reverse("comp") will</li> </ul>	otal Marks 30]
<ul> <li>l Implement a class 'invertdata' to overload 'invert' function as follows:</li> <li>a) int invert ( int) - returns the inverted integer. eg. invert(5438) will return 8345</li> <li>b) char * invert ( char *) - returns the reversed string - eg. reverse("comp") will return "pmoc"</li> </ul>	[10]
<ul> <li>l. Implement a class 'invertdata' to overload 'invert' function as follows:</li> <li>a) int invert ( int) - returns the inverted integer. eg. invert(5438) will return 8345</li> <li>b) char * invert ( char *) - returns the reversed string - eg. reverse("comp") will return "pmoc"</li> <li>c) void invert( int * ) - will reverse the array order - An array [5, 7, 12, 4] will be</li> </ul>	
<ol> <li>Implement a class 'invertdata' to overload 'invert' function as follows:         <ul> <li>int invert (int) - returns the inverted integer. eg. invert(5438) will return 8345</li> <li>char * invert (char *) - returns the reversed string - eg. reverse("comp") will return "pmoc"</li> <li>void invert(int *) - will reverse the array order - An array [5, 7, 12, 4] will be inverted to [4, 12, 7, 5].</li> </ul> </li> </ol>	[10]
<ol> <li>Implement a class 'invertdata' to overload 'invert' function as follows:         <ul> <li>int invert (int) - returns the inverted integer. eg. invert(5438) will return 8345</li> <li>char * invert (char *) - returns the reversed string - eg. reverse("comp") will return "pmoc"</li> <li>void invert(int *) - will reverse the array order - An array [5, 7, 12, 4] will be inverted to [4, 12, 7, 5].</li> </ul> </li> </ol>	[10] [8] [7]
<ul> <li>l. Implement a class 'invertdata' to overload 'invert' function as follows:</li> <li>a) int invert ( int) - returns the inverted integer. eg. invert(5438) will return 8345</li> <li>b) char * invert ( char *) - returns the reversed string - eg. reverse("comp") will return "pmoc"</li> <li>c) void invert( int * ) - will reverse the array order - An array [5, 7, 12, 4] will be</li> </ul>	[10]
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<ol> <li>Implement a class 'invertdata' to overload 'invert' function as follows:         <ul> <li>int invert (int) - returns the inverted integer. eg. invert(5438) will return 8345</li> <li>char * invert (char *) - returns the reversed string - eg. reverse("comp") will return "pmoc"</li> <li>void invert(int *) - will reverse the array order - An array [5, 7, 12, 4] will be inverted to [4, 12, 7, 5].</li> </ul> </li> <li>Write a main function that uses the above class and its member functions.</li> </ol>	[10] [8] [7] [5]
<ol> <li>Implement a class 'invertdata' to overload 'invert' function as follows:         <ul> <li>a) int invert ( int) - returns the inverted integer. eg. invert(5438) will return 8345</li> <li>b) char * invert ( char *) - returns the reversed string - eg. reverse("comp") will return "pmoc"</li> <li>c) void invert( int *) - will reverse the array order - An array [5, 7, 12, 4] will be inverted to [4, 12, 7, 5].</li></ul></li></ol>	[10] [8] [7] [5] d seconds. Define ors appropriately. [2+3] [20]

Duration: 3 Hours

Q.1) Data Structures Using 'C'

Q.1) Data Structures Using 'C'  1. Implement a stack library (ststack.h) of integers using a static implementation of t implementing the Init(), Push(), Pop(), Is Empty() & Is Full() these operations. Write program that includes stack library and calls different stack operations	[ <b>Total Marks 40</b> ] he stack and a Menu driven
<ul><li>Push &amp; Pop Function each carries 5 Marks</li><li>Init Function</li></ul>	[10]
<ul> <li>IsEmpty Function &amp; IsFull Function each carries 2 marks</li> <li>Implement a list library (doublylist.h) for a doubly linked list of integer with the insearch, display operations. Write a menu driven program to call the operations.</li> </ul>	[4] asert, delete
<ul> <li>Creation and Display of doubly link list each carries 4 marks</li> <li>Insert, Delete carries 6 marks each</li> </ul>	[8] [12]
* Search Function	[5]
OR	Ç~ 1
<ul> <li>Q.1) Data Structures Using 'C'</li> <li>1. Banks often record transactions on an account, in order of the times of the transactions like to receive their bank statements with cheques listed in order by cheque number. Powrite(use) cheques in order by cheque number, and merchants usually cash them with dispatch. Thus few cheque numbers are usually out of order. Use an appropriate sorting converting time of transaction ordering to cheque number ordering. Formulate the prol program to solve the problem by using appropriate data structures and algorithms.</li> </ul>	eople usually reasonable g algorithm for
Q 2) Object Oriented Concepts and Programming in C++:	[Total Marks 30]
<ol> <li>Implement a class 'printdata' to overload 'print' function as follows:</li> <li>a) void print(int) - outputs value - <int>, that is, value followed by the value of the</int></li> </ol>	1
eg. print(10) outputs value -<10> b) void print (int, int) – outputs value - [ <int>, <int>], that is, value followed by the</int></int>	[5]
two integers separated by comma in square brackets. eg print(4,6) outputs value-[<4>,<6>]	[5]
<ul> <li>c) void print(char *) – outputs value – "char*", that is, value followed by the string double quotes. eg print("hi") outputs value-"hi"</li> <li>d) void print(int n, char *)- display first n characters from the given string.</li> </ul>	in [5]
eg print(3,"Object")- outputs value - "Obj"  e) void print(char ch, char *)- count occurrences of a character from the given strir	[5]
eg print('P',"CPP Programming")- outputs value -3 Write a main function that uses the above class and its member functions.	[5] [5]
OR  2. Implement a class Time12 which stores time in 12 hr format (hh, mm, ss, am/pm). four data members, three integers for hour, minutes and seconds and a character arm 2 storing am/pm. Define constructor with default arguments (midnight). Define accordisplay functions. Implement a second class Time24 which stores time in 24 hr format (hh, mm, ss). It has three data members, three integers for hours, minute& se Implement following functions:	ay of size ept and
<ul> <li>a) Friend function isequal() to compare time in 12 hr format to time in 24 hr format</li> <li>b) convert time in 12 hr format to 24 hr format</li> <li>constructor of class Time12 with default argument</li> <li>Accept &amp; display Function</li> <li>Write a main function that uses the above class and its member functions.</li> <li>Q.3) Viva</li> </ul>	[8] [6] [5] [5] [6]
	[AV]

	main ivialks. 00
Q.1) Data Structures Using 'C'  1. Create a random array of n integers. Accept a value x from user and use linear so algorithm to check whether the number is	[Total Marks 40]
position if the number is present.  • Accept & Display Function	he
• Linear Search Function	[8] [7]
2. Implement a stack library (dystack.h) of integers using a dynamic (linked list) implementation of the stack and implementing the init, push, pop, peek& isempty operations. Write a menu driven program that includes stack library and calls different stack operations.	
<ul> <li>Push &amp; Pop operation carries 8 marks each</li> <li>Init</li> </ul>	[16]
<ul> <li>Peek &amp; Is empty operation carries 4 marks each</li> </ul>	[1]
operation earlies 4 marks each	[8]
OR	
Q.1) Data Structures Using 'C'	
1. In breadth first search (BFS) of a Graph we start at vertex v and mark it as having been visited. All unvisited vertices adjacent from v are visited next. The v is thus completely explored. The visited but at unexplored vertices are taken up next for exploration. Exploration continues until no unexplored vertex is left. If BFS is use connected undirected graph G, then all vertices in G get visited and the graph is completely traversed. Thus BFS can be used to check whether graph is connected Formulate the problem and write a C program to solve the problem by using appredata structures and algorithms.	ed on a
Q 2) Object Oriented Concepts and Programming in C++:	Motal Manie 30:
1. Write a C++ program to implement the following:  Define a class 'city' with data members name and STD code. Accept 'n' cities codes from user. Store this data in the file 'cities.txt'. Write a program that react from file cities.txt into the array. Output the list of city with STD codes. Write function to search a city by name and display its STD code.  Accept and display function definition-each carries 2 marks  Writing data to a file and reading data from a file-each carries 5 marks  Display list of cities with STD codes from file  Search function  Write main function that uses the above class and its member functions.	ls the data a search  [ 4]  [10]  [5]  [6]  [5]
2. Define a class named Complex for representing complex and the complex and the complex and the complex for representing complex and the comp	
has the general form a + ib, where a- the real part, b - the imaginary part are both real numbers and i <sup>2</sup> =-1. Define parameterized and default constructor. Overload +, - and operators with usual meaning.  • Default constructor & Parameterized constructor-each carries 3 marks  • Overloading of + operator & - operator- each carries 5 marks	
• Overloading of * operator	[10]
Write a main function that uses the above class and its member functions.	[9] [5]
Q.3) Viva	Among Common

# Q.1) Data Structures Using 'C'

[Total Marks 40]

- 1. Implement a list library (singlylist.h) for a singly linked list of integer with the operations create, Delete, display. Write a menu driven program to call these operations.
  - Create & Delete at front, Display Operation Carries 5 Marks each.

[15]

- 2. Implement a queue library (dyqueue.h) of integers using a dynamic (circular linked list) implementation of the queue and implementing the above Insert, Delete, Is Empty operations. Write a menu driven program that includes queue library and calls different queue operations.
  - Insert, Delete, Create, Is Empty, Display operation carries 5 marks each

OR

[25]

# Q.1) Data Structures Using 'C'

1. Given a data set consisting of n integers, a five point summary is to be produced consisting of Minimum, Maximum, Median, 1st and 3rd Quantile. Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms.

# Q 2) Object Oriented Concepts and Programming in C++:

[Total Marks 30]

- 1. Implement a class Message having two data members a pointer to character and an integer storing length of the string. Implement a class Key having two data members a character array of size 30 and an integer storing actual length of the string. The restrictions on Key are that the length should be less than 30 but minimum size 8 and having atleast one digit and one upper case character in it. Write a friend function to encrypt a Message using key (use some encryption algorithm) and decrypt the encrypted text and display it.
  - Accept and Display function for Message & Key class -each carries 5 marks

[10]

• Friend function to encrypt the message using encryption algorithm and display encrypted text.

[10]

• Write a main function that uses the above class and its member functions.

[5] [5]

OR

2. Implement the following class hierarchy

• Decrypt the encrypted text and display it.

student (course)

Teacher (department)

Teaching-Assistant()

Define constructors and appropriate functions to accept and display details.

• Parameterized constructor, accept and display for each class carries-(2+2+2) marks Write main function to accept details of 'n' Teaching-Assistants and display the details.

Q.3) Viva

[10]

[24]

[6]

(J.1) Data Structures Using 'C' [Total Marks 40] 1. Implement a list library (singlylist.h) for a singly linked list of integers with the operations create, search, display. Write a menu driven driver program to call these operations. Create ,Search, Display operation carries 5 each 2. Write a C program which uses Binary search tree library and implements following [15] Create Binary Search Tree Count non leaf nodes in binary search tree [10] Display a binary search tree (Pre order Traversal) [10] [5] Data Structures Using 'C' OR 1. A spell checker is a program that looks at a document and compares each word in the document to words stored in a dictionary. If it finds words in the dictionary, it moves on to the next word, If it does not find the word, it reports the user about the misspelled(possibly) word. Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms. Q 2) Object Oriented Concepts and Programming in C++: Write the definition for a class called 'time' that has hours, minutes & seconds as integer [Total Marks 30] data members. Consider 24 hr format. The class has the following member functions: a)void settime(int, int, int) to set the specified values of hours, minutes and b) void showtime() to display contents of time object. c)time add(time) add the corresponding values of hours, minutes and seconds [5] (<60) in time object argument to current time object and make appropriate [5] d) time diff(time) subtract values of hours, minutes and seconds in time object argument from current time object after making appropriate conversions and [8] return time difference. Write a main program to illustrate the use of above class and member function. [8] [4] OR 2. Write the definition for a class called Rectangle that has floating point data Members length and width. The class has the following member functions: a) void setlength(float) to set the length of data member b) void setwidth(float) to set the width of data member c) float perimeter() to calculate and return the perimeter of the rectangle [2] d) float area() to calculate and return the area of the rectangle [2] [2] e) void show() to display the length and width of the rectangle [2] f) Overload compare() to- compare two rectangles by length and width [2]

-compare two rectangles by area

Write main function to create two rectangle objects and display each rectangle

Q.3) Viva

and its area and perimeter.

[10]

[7]

[8]

[5]

Maximum	Marks: 80
- uccures Using 'C'	otal Marks 40
<ol> <li>Implement a list library (doublylis.h) for a doubly linked list of integers with create, Insert &amp; display operations. Write a menu driven program to call these operatio</li> <li>Create Insert at end, Display carries 5 mark each</li> <li>Implement a queue library (stqueue.h) of integers using a static implementation of the queue and implementing the Insert Poleta Information of the program of the Insert Poleta Information of the program of the Insert Poleta Information of the program of the Insert Poleta Information of the Insert Information of t</li></ol>	[15]
queue and implementing the Insert, Delete, IsEmpty, IsFull, Init, Peek operations. Write a larven program that includes queue library and calls different queue operations.  Insert, Delete operation carries 8 mark each	Menu
<ul> <li>IsEmpty, IsFull function carries 3 mark each</li> <li>Init, Peek function</li> </ul>	[16] [6] [3]
OR	(-)
Q.1) Data Structures Using 'C'	
1. A spell checker is a program that looks at a document and compares each word in the document to words stored in a dictionary. If it finds words in the dictionary, it moves on the next word, If it does not find the word, it reports the user about the misspelled(possil word. Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms.	to oly)
Q 2) Object Oriented Concepts and Programming in C++: [To	tal Marks 30
<ol> <li>Define a class Message with two data members one character pointer and an integer storing length. Implement following functions:         <ul> <li>a)Default constructor and Parameterized constructor</li> <li>b) Overload binary + operator to represent concatenation of messages</li> <li>c)Overload [] operator to return a character at a specific position</li> <li>d) Overload = operator to copy one Message object to another.</li> </ul> </li> <li>Write a main function that uses the above class and its member functions.</li> </ol>	[2+3] [7] [8] [5]
OR	
2. Write the definition for a class called 'time' that has hours, minutes & seconds as integer data members. Consider 24 hr format. The class has the following member functions:  a) void settime(int, int, int) to set the specified values of hours, minutes and	
seconds in object.  b) void showtime() to display contents of time object.  c)time add(time) add the corresponding values of hours, minutes and seconds  (<60) in time object argument to current time object and make appropriate	[5] [5]
d) time diff(time) subtract values of hours, minutes and seconds in time object argument from current time object after making appropriate conversions and	[8]
Write a main program to illustrate the use of above class and member function.	[8] [4]

[10]

Q.3) Viva

[10]

	Maximum Marks: 80
Q.1) Data Structures Using 'C'	[Total Marks 40]
1. Implement a list library (doublylis.h) for a doubly linked list of integers operations. Write a menu driven program to call these operations.	with create, Delete & display
• Create, delete at end, display operation carries 5 mark each	[15]
Write a function that checks whether a string of characters is palindrome of function should use a stack library (cststack.h) of stack of characters using implementation of the stack.	or not. The g a static
<ul> <li>Push, Pop operation carries 5 mark each</li> </ul>	[10]
<ul> <li>Palindrome function</li> </ul>	[10]
<ul> <li>Init,IsEmpty function</li> </ul>	[5]
o a	[3]
OR	
Q.1) Data Structures Using 'C'	
consisting of Minimum, Maximum, Median, 1st and 3rd Quantile. Formuland write a C program to solve the problem by using appropriate data strulagorithms.  Q 2) Object Oriented Concepts and Programming in C++:  1. Implement a class Message having two data members a pointer to character of the string. Implement a class Key having two data members a character storing actual length of the string. The restrictions on Key are that the leminimum size 8 and having atleast one digit and one upper case character encrypt a Message using key (use some encryption algorithm) and decryption.	[Total Marks 30]  ter and an integer storing length or array of size 30 and an integer ength should be less than 30 but the init Writer file.
<ul> <li>Accept and Display function for Message &amp; Key class –each carries 5 in Friend function to encrypt the message using encryption algorithm and encrypted text.</li> </ul>	display
Decrypt the encrypted text and display it.	[10]
Write a main function that uses the above class and its member function	[5]
that uses the above class and its member function	[5]
OR	
<ol> <li>Define a class named Complex for representing complex numbers. A complex the general form a + ib, where a- the real part, b - the imaginary part are numbers and i²=-1. Define parameterized and default constructor. Overload operators with usual meaning.</li> </ol>	a both mad
• Default constructor & Parameterized constructor-each carries 3 marks	[6]
• Overloading of * operator & - operator - each carries 5 marks	[10]
<ul> <li>Overloading of * operator</li> <li>Write a main function that uses the above class and its member functions.</li> </ul>	[9] [5]

Q.3) Viva

Κ,	value structures Using 'C'	
		[Total Marks 40]
	1. Implement a list library (doublylis.h) for a doubly linked list of integers with create operations. Write a menu driven program to call these operations.	e, search & display
	<ul> <li>Create , search, display operation carries 5 mark each</li> </ul>	[1 ]
		[15]
	<ul> <li>2. Write a function that reverses a string of characters. The function should use a stack library (cststack.h) of stack of characters using a static implementation of the stack</li> <li>Push ,Pop operation carries 5 mark each</li> </ul>	
	reverses function	[10]
	dire, is empty function	[10]
Q.1	1. Banks often record transactions on an account, in order of the times of the transactions but many people like to receive their bank statements with cheques listed in order the cheque number. People usually write(use) cheques in order by cheque number, and merchants usually cash them with responsibility.	oy I
	ordering to cheque number ordering. Formulate the problem and write a C program solve the problem by using appropriate data structures and algorithms.	nsaction to
(2 L)	Object Oriented Concepts and Programming in C++.	Total Marks 30]
t f a h	Define a class 'Fraction' having integer data members numerator and denominator. Define parameterized and default constructors (default values 0 and 1). Parameterized constructor should store the fraction in reduced form after dividing both numerator and denominator by gcd(greatest common divisor). Write a private function member to compute gcd of two integers. Write four member functions for addition, subtraction. multiplication and division of fraction objects. Each function will general of function objects as arguments.	
€	gcd() function  Default constructor and P	[3]
6	Default constructor and Parameterized constructor  Addition Subtraction and Division Subtraction S	[1+4=5]
8	Addition, Subtraction and Division function - each carries 5 marks  Multiplication() function	[15]
W	rite the main function to illustrate the use of the class and member function.	[2]
	o mastrate the use of the class and member function.	[5]
. *	OR	
2. Important mer intermer a)	plement a class vector which contains integers in sorted order. The size of the vector value mory should be dynamically allocated. It should have three data members vectorarray eger, maxsize – the maximum allocated size to take care of insertions and size – actual maximum for:  Parameterized constructor © constructor each against 6	aries so the a pointer to size. Write
b)	o a purious Dosinon in Vector	[10]
c)	insert values in vector to keep it in sorted order	[3]
d)	Print the vector	[5]
e) Writ	Implement the member functions to form union of two vectors.	[2]
AA î Î Î	te the main function to illustrate the use of the class and member function.	[5] [5]
Q.3)	Viva	S. 1
		10

O 11 Date Cture of the Control of th	Maximum Marks: 80
Q.1) Data Structures Using 'C'  1. Implement a stack library (ststack h) of integers using a static implementation of the proof of the	[Total Marks 40]
stack and implementing the Push, Pop, Isempty, IsFull operations. V	Montation of tile
morados stack notary and cans different stack operations.	vrite a menu driven program that
<ul> <li>Push &amp; Pop operation carries 5 marks each</li> </ul>	[10]
<ul> <li>Is Empty</li> </ul>	
<ul><li>Is Full</li></ul>	[2]
2 Implement a list library (doublylis.h) for a doubly linked list of charact	[3]
search & display operations. Write a menu driven program to call these	ers with Create, insert, delete,
Insert Doloto arrests and I is a program to call these	e operations.
• Insert, Delete, create, search, display	[6+6+5+4+4]
OR OR	•
Q.1) Data Structures Using 'C'	
1. In depth first search of a Graph we start at vertex v and mark it as having b	een visited.
The exploration of the vertex illvolves visiting all the adjacent vertices how	orrom 61
exploration of a vertex is suspended as soon as a new vertex is reached and	l tha
exploration of a new vertex begins. When the exploration of new vertex is	arram the
exploration v is resumed. Dr's can be best implemented as a recursive fund	ation A
topological soft of a directed acvelle graph is a linear ordering of all its year	tions and di
if G contains an edge (u, v), then u appears before v in the ordering. For top	actories
ordering DFS is called on the graph and every vertex explored is added ont	pological
linked list that forms the topological order. Formulate the problem and written solve the problem by writing to solve the problem by writing to solve the problem.	o the front of a
to solve the problem by using appropriate data structures and algorithms.	te a C program
O 3) Object October 18	
Q 2) Object Oriented Concepts and Programming in C++:	[Total Marks 30]
1. Implement a class vector which contains integers in sorted order. The size	a of the
and the dynamically amounted. If should have three data member	ra vioatama
integer, maxsize – the maximum allocated size to take care of insertions an	ed size actual size W.
member function:	id size – actual size. Write
a) Parametrized constructor & copy constructor-each carries 5 marks	
b) Set value at a particular position in vector	[10]
c) To insert values in seast-set at	[3]
<ul><li>c) To insert values in vector to keep it in sorted order</li><li>d) Print the vector</li></ul>	[5]
	[2]
e) Implement the Write member functions to form intersection of two very Write the main factorial will be with the main factorial will be writer to the writer the writer the writer than the writer tha	ectore
Write the main function to illustrate the use of the class and member function	ion. [5]
OR	f-1
2. Design a class Book with the data members to hold title, number of author	TODA
number, price and number of copies. The title and ISBN number are point	ors, 15BN
characters. Define following functions:	ter to
a) parameterized constructor with dynamic memory allocation	
b) default constructor (number of outbors and and 1 constructor)	[8]
<ul><li>b) default constructor(number of authors and number of copies equal to 1</li><li>c) Copy constructor</li></ul>	). [2]
d) Display() function	[4]
	F27
e) Write a member function to check the validity of the ISBN number; it is	ic a unique 10 d'ave
assigned to a book. For 10 digit 18BN number, the sum of all the 10 dig	oits multiplied by its inte
weight, descending from 1 to 10 1, or ascending from 1 to 10, is a multip	ole of 11. [8]
$10x1+9x2+8x3+/x4+6x5+5x6+4x7+3x8+2x9+1x10 \equiv 0 \mod 11$	[6]
Call the function in the constructor before initializing the ISBN number	
Write the main function to illustrate the use of the class and member funct	ion rei
Q.3) Viva	[-1
	[10]

# Q.1) Data Structures Using 'C'

[Total Marks 40]

1 Implement a list library (doublylis.h) for a doubly linked list of integers with create, search & display operations. Write a menu driven program to call these operations.

Create, search, display operation carries 5 mark each

[15]

2. Implement a queue library (stqueue.h) of integers using a static implementation of the queue and implementing the insert, delete, is Full, Isempty, Init, Peek operations. Write a menu driven program that includes queue library and calls different queue operations.

Insert, Delete operation carries 8 mark each

[16]

IsEmpty, IsFull function carries 3 mark each

[6] [3]

Init ,Pæk function

OR

#### Data Structures Using 'C' $Q.\tilde{1}$

1. In breadth first search (BFS) of a Graph we start at vertex v and mark it as having been visited. All unvisited vertices adjacent from v are visited next. The v is thus completely explored. The visited but at unexplored vertices are taken up next for exploration. Exploration continues until no unexplored vertex is left. If BFS is used on a connected undirected graph G, then all vertices in G get visited and the graph is completely traversed. Thus BFS can be used to check whether graph is connected. Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms.

# Q 2) Object Oriented Concepts and Programming in C++:

[Total Marks 30]

1. Implement a class 'printdata' to overload 'print' function as follows: a)void print(int) - outputs value - <int>, that is, value followed by the value of the integer. eg. print(10) outputs value -<10> b) void print (int, int) - outputs value - [<int>, <int>], that is, value followed by the

[5]

two integers separated by comma in square brackets. eg print(4,6) outputs value-[<4>,<6>]

c)void print(char \*) - outputs value -"char\*", that is, value followed by the string in

[5]

[5]

double quotes. eg print("hi") outputs value-"hi" d) void print(int n, char \*)- display first n characters from the given string. eg print(3,"Object")- outputs value - "Obj"

[5]

e)void print(char ch, char \*)- count occurrences of a character from the given string. eg print('P',"CPPProgramming")- outputs value -3

[5]

Write a main function that uses the above class and its member functions.

[5]

2. A Matrix has rows and columns which decide the number of elements in the matrix. Implement a matrix class that can handle integer matrices of different dimensions. Overload addition, subtraction and multiplication operator to carry out usual matrix addition, subtraction and multiplication.

& Parameterized constructor a)Default constructor

[2+3][12]

b) Overloading of + & - operator-each carries 6 marks

[8]

c)Overloading of \* operator Write a main function that uses the above class and its member functions.

[5]

Q.3)Viva [10]

Maximum Marks: 80 [Total Marks 40] 1. Create a random array of n integers. Accept a value x from user and use linear search algorithm to check whether the number is present in the array or not and output the position if the number is present. Accept & Display Function [8] Linear Search Function [7] 2. Write a C program which uses Binary search tree library and implements following **Functions** Create Binary Search Tree [10] Search a node in binary search tree [10] Display a binary search tree (Post order Traversal) [5] OR Q.1)Data Structures Using 'C' 1. In breadth first search (BFS) of a Graph we start at vertex v and mark it as having been visited. All unvisited vertices adjacent from v are visited next. The v is thus completely explored. The visited but at unexplored vertices are taken up next for exploration. Exploration continues until no unexplored vertex is left. If BFS is used on a connected undirected graph G, then all vertices in G get visited and the graph is completely traversed. Thus BFS can be used to check whether graph is connected. Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms. Q 2) Object Oriented Concepts and Programming in C++: [Total Marks 30] 1. Design a class Book with the data members to hold title, number of authors, ISBN number, price and number of copies. The title and ISBN number are pointer to characters. Define following functions: a)parameterized constructor with dynamic memory allocation [8] b) default constructor(number of authors and number of copies equal to 1). [2] c)Copy constructor [4] d) Display() function [3] e)Write a member function to check the validity of the ISBN number; it is a unique 13 digit number assigned to a book. For 13 digit ISBN number, the last digit is a check digit which must range from 0 to 9 and sum of all the thirteen digits multiplied by weights alternating between 1 and 3 is a multiple of 10.  $x1+3x2+x3+3x4+x5+3x6+x7+3x8+x9+3x10+x11+3x12+x13 \equiv 0 \mod 10$ Call the function in the constructor before initializing the ISBN number. [8] Write the main function to illustrate the use of the class and member function. [5] 2. Implement a class 'invertdata' to overload 'invert' function as follows: a) int invert (int) - returns the inverted integer. Eg. invert(5438) will return 8345 [10] b) char \* invert ( char \*) - returns the reversed string - reverse("comp") will return "pmoc" [8] c) void invert( int \*) - will reverse the array order - An array [5, 7, 12, 4] will be inverted to [4, 12, 7, 5]. Write a main function that uses the above class and its member functions. [5]

[10]

Q.3)

Viva

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Maximum	Marks.	X()
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Q.1) Data Structures Using 'C'	[Total 40 Marks]
1. Implement a list library (doublylis.h) for a doubly linked list of integers with	create, search & display
operations. Write a menu driven program to call these operations.	
• Create, search, display operation carries 5 mark each	[15]
2. Write a function that reverses a string of characters. The function should use a string	ack
library (cststack.h) of stack of characters using a static implementation of the sta	ick.
<ul> <li>Push ,Pop operation carries 5 mark each</li> </ul>	[10]
• reverses function	[10]
<ul> <li>Init,IsEmpty function</li> </ul>	[5]
OR	
Q.1) Data Structures Using 'C'	
• 1. Banks often record transactions on an account, in order of the times of the	ve
transactions, but many people like to receive their bank statements with cheques	listed
in order by cheque number. People usually write(use) cheques in order by cheque	
number, and merchants usually cash them with reasonable dispatch. Thus few che	
numbers are usually out of order. Use an appropriate sorting algorithm for conver-	
time of transaction ordering to cheque number ordering. Formulate the problem as	nd
write a C program to solve the problem by using appropriate data structures and	
algorithms.	
<ul> <li>Q 2) Object Oriented Concepts and Programming in C++:</li> <li>1. Implement a class Time12 which stores time in 12 hr format (hh, mm, ss, am/p four data members, three integers for hour, minutes and seconds and a character at 2 storing am/pm. Define constructor with default arguments (midnight). Define a display functions. Implement a second class Time24 which stores time in 24 hr format (hh, mm, ss). It has three data members, three integers for hours, minute&amp; Implement following functions:</li> <li>a) Friend function isequal() to compare time in 12 hr format to time in 24 hr format</li> <li>b) convert time in 12 hr format to 24 hr format</li> <li>constructor of class Time12 with default argument</li> <li>Accept &amp; display Function</li> <li>Write a main function that uses the above class and its member functions.</li> </ul>	array of size ccept and seconds.
OR	
<ol> <li>Implement a class 'data' to overload following functions as follows:         <ul> <li>int maximum(int, int) – returns the maximum between the two integer argumeth) int maximum(int *a, int arraylength) – returns the maximum integer from an active void maximum(int *a, int arraylength, int n) – display all elements from the active which are greater than given number 'n'.</li> <li>int minimum(int, int) – returns the minimum between the two integer argumented int minimum(int *, int arraylength) – returns the minimum integer from an arraylength int n) – display all elements from the active which are smaller than given number 'n'.</li> </ul> </li> <li>Write a main function that uses the above class and its member functions.</li> </ol>	rray 'a' [5] array 'a' [5] ats [2] ay 'a' [5]
Q.3) Viva	[10]

	(TE / 140 NE
display operations Write a many drivers a singly linked list of integers with create, Do	[Total 40 Marks]
operations. Write a menu univen program to call these operations	
Create & Delete at in hetween Display Operation Coming 5	E4.47
quede and implementing the insert delete is full Isempty Init Dools and its	
driven program that includes queue library and calls different queue operations.	e a menu
• Insert, Delete operation carries 8 mark each	
IsEmpty, IsFull function carries 3 mark each	[16]
• Init ,Peek function	[6]
OR	[3]
Q.1) Data Structures Using 'C'	
1. Given a data set consisting of n integers, a five point summary is to be produce	
consisting of Minimum, Maximum, Median, 1st and 3rd Quantile. Formulate the pand write a C program to solve the problem by	d
and write a C program to solve the problem by using appropriate data structures are	roblem
algorithms.	ıd
Q 2) Object Oriented Concepts and Programming in C++:	
1. Define a class account with full and its account with a superior with	[Total Marks 30]
1. Define a class account with following specifications: private data members:	
2 account number outsmall 11	
• account number – automatically generated six digit account number, first two digit code (assume the value 82) and next four digits for a second number.	t are used for bank
tardo 02/ and next foll fille for secount number as at a 1	word)
• account type – it can be one of the following type { saving, current, fixed, recurring}	
recurring;	
amount – long integer for the balance amount     Owner News	
• Owner Name – name of the owner Public data members:	
The state account municipal and use of static keyword	[7]
Accept() with validation for account type	[3]
Other data members	[2]
b) Display account information	[5]
c) Deposit an amount in an account	[2]
d) Withdraw an amount after checking the minimum balance condition	[3]
write a main program to accept information from user and onen 'n' accept	[5]
(Use dynamical memory allocation) and display their information.	[8]
OB	$\lceil c \rceil$
2. Define a class 'Fraction' having integer data members numerator and denominator.	
parameterized and default constructors (default values 0 and 1) D	constructor should
	have two fraction
the man function to musifale the fige of the class	z zacyo two machon
gcd() function	[2]
Default constructor and Parameterized constructor	[3]
<ul> <li>Addition, Subtraction and Division function - each carries 5 marks</li> </ul>	[1+4]
• Multiplication() function	[15]
Write the main function to illustrate the use of the class and member function.	[2]
	[5]
Q.3) Viva	F4.03
	[10]

[Total Marks 40]

- 1. Read the data from the file "employee.txt" and sort on age using insertion sort.
  - Reading & Display the file

[10]

Insertion sort Function

[5]

- 2. Implement a list library (doublylist.h) for a doubly linked list of characters with the insert, delete search & display operations. Write a menu driven program to call the operations.
  - Insert, delete, create, search, display

[6+6+5+4+4]

#### OR

# Q.1) Data Structures Using 'C'

1. In depth first search of a Graph we start at vertex v and mark it as having been visited. The exploration of the vertex involves visiting all the adjacent vertices however the exploration of a vertex is suspended as soon as a new vertex is reached and the exploration of a new vertex begins. When the exploration of new vertex is over, the exploration v is resumed. DFS can be best implemented as a recursive function. A topological sort of a directed acyclic graph is a linear ordering of all its vertices such that if G contains an edge (u, v), then u appears before v in the ordering. For topological ordering DFS is called on the graph and every vertex explored is added onto the front of a linked list that forms the topological order. Formulate the problem and write a C program to solve the problem by using appropriate data structures and algorithms.

# Q 2) Object Oriented Concepts and Programming in C++:

[Total Marks 30]

- 1. Define a class named Clock with three integer data members for hours, minutes and seconds. Define parameterized and default constructors. Overload increment and decrement operators appropriately. Overload extraction and insertion operators. Consider 24 hour format.
  - Default constructor and Parameterized constructor

[2+3]

• Overloading of each operator carries 5 marks

[20]

Write a main function that uses the above class and its member functions.

[5]

#### OR

- 2. Implement a class "file" with four data members, a string storing the name of the file and integers storing the number of characters, words and lines in the file. Write the following member functions:
  - a) The constructor takes only the file name as the argument and opens the file, counts the characters, words and lines and initializes the other data members.

If the file does not exist creates a blank file with the name and other data members are initialized to zero.

b) member functions that count number of blank lines

[5]

c) searches for occurrence of word in the file

[6]

c) scarciles for occurrence of word in the file

[6]

Write main function that uses the above class and its member functions.

[5]

Q.3) Viva

[10]